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On becoming an authentic learner: semiotic activity in the early grades

BERT VAN OERS and WILLEM WARDEKKER

A Vygotskian perspective assumes that authentic learning must be conceived of as a process of meaning construction having both personal and cultural relevance. From this point of view authentic learning is a psychological capacity formed during a student's school career. This development involves becoming a legitimate participant in the cultural activity called learning. This paper explores some developmental roots of this learning activity in 4- to 7-year-old children's play. From our theoretical perspective we contend that the activity of dealing reflectively with interrelationships between signs and meanings (i.e. semiotic activity) might be one psychological precursor of constructive learning activity. We ask: Can young children perform the required semiotic activity during play? Is the activity meaningful for them? What are the implications of our findings for curriculum and for curriculum theory? We analysed different video-recordings of young children engaged in play in small groups in classroom settings. Results suggest that young children can be engaged meaningfully in semiotic activities during play, provided some assistance is given by a teacher or peers. We take these results as indications of the authenticity of these activities for young children. For curriculum it might mean that early promotion of semiotic activity should be taken as a basis for developing authentic learning.

What is authentic learning?¹

The relevance of education

Almost 30 years ago in *The Relevance of Education*, Bruner (1971: 19) recommended a form of education that attempted to increase 'the child's power of thought by inventing for him [*sic*] modes of access to the empowering techniques of the culture'. The relevance of education lies in its capacity to improve a child's intellect and enhance his or her abilities to participate in cultural activities. In the course of this argument, Bruner (1971: 18) put forth his well-known hypothesis:

For any knowledge or empowering skill that exists in the culture there is a corresponding form that is within the grasp of a young learner at the stage of development where one finds him – that any subject can be taught to anybody at any age in some form that is both interesting and honest.

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Although his ideas have changed in the intervening period, Bruner is still trying to understand the peculiarities of improving the capacities needed for participating in a culture. He now (1996: 137) emphasizes a view of education in which participation in cultural activities is not just the perspective that awaits pupils at the end of their time in school; he understands that such participation is a characteristic of human beings from the very beginning of life. And school, he contends, is not just a place for inculcating subject-matter, it is also a place for reinventing, renewing and refreshing the culture of every new generation. In schools, pupils already participate in cultural activities, thereby learning to participate in a more competent way and, at the same time, to renew the very activities in which they learn to participate.

In this approach to school learning, Bruner suggests a form of learning that we call 'authentic learning'. For many others, this concept refers to a form of learning in which a pupil takes a deep personal interest often thought to be based in 'natural' personality traits, so that in some cases authenticity and the points of view of a culture to be learned in school are seen to be in opposition to each other. For Bruner, however, this kind of learning is obviously related simultaneously to both personal interests and cultural significance. Conceptually, these two issues are closely related to what Leont'ev (1978) calls, respectively, the *sense* and the *meaning* dimensions of learning. Learning to participate implies giving a personal sense to culturally pre-given meaning structures.

Authenticity, the self and culture

This interpretation of authenticity as a relationship between the personal and the cultural is by no means new. For Socrates 'authenticity' was a moral ideal, related to spiritual welfare, that may be achieved – if ever – by painstakingly scrutinizing one's own actions. Such 'living an examined life' (Brickhouse and Smith 1994) was the basis for really getting to know one's self. For Socrates this ideal was not purely self-oriented, but it required insight (true knowledge) into the foundations of one's behaviour in the community. As such, 'authenticity' was also intrinsically related to justifiable actions in cultural practices. This notion of authenticity also ran through Montaigne's [1533–92, French philosopher] writings, although he did not use the word. In the middle of the 17th century, however, philosophy and science gradually turned away from practical affairs, to study the general, objective laws of reality, and to construct abstract, timeless, universal theories (Toulmin 1992). The authentic became more and more related to the private and individualistic.

Taylor (1991) sees this latter interpretation of authenticity as a lapse in modern thinking. He criticizes the interpretation of authenticity as purely individual, because it falsely suggests that a human being can regain self-respect and a sense of well-being in a modern de-personalized world by celebrating a sacrosanct self. In his mind, individuality is no radical disengagement of self from society, but a personal assimilation of societal demands and personal interests. Similarly, from a Vygotskian and Bakh-

tinian point of view, Wertsch (1991) refutes the notion of the disengaged image of self in favour of a conception of the individual as an agent in sociocultural practices.

From our perspective, authenticity includes personal interests and cultural values. Authenticity amounts to an ideal of making a personal version of a sociocultural practice, integrating personal interests (sense) and cultural values (meanings). In other words, authenticity refers to a personal capacity for critically participating in some cultural practice. Consequently, authenticity is not a natural quality of human existence but a quality that must be acquired in a person's cultural development. This development of authenticity begins with peripheral legitimate participation in cultural practices (Lave and Wenger 1991), and proceeds by improving one's capacity for participating critically, more independently, and in a self-responsible way.

From our perspective, therefore, authenticity does not imply learning merely according to one's own pre-given desires and private standards. The relation is the other way around: by learning to participate in an independent way, the self, the personality, is being constructed simultaneously (Wardekker 1996). Authentic learning is a dynamic relation between a personality-under-construction and cultural practices-being-reconstructed, which is aimed at developing an authentic and autonomous person able to participate in a competent yet critical way in cultural practices.

Opportunities for authentic learning

What characteristics are relevant or necessary for education in schools to provide opportunities for authentic learning in this sense? First, we distinguish two different meanings of 'learning' (Van Oers 1996a):

1. *Learning as a microgenetic process*, based on qualitative changes of actions. In these cases of learning, an already acquired action is improved by repeated practice, with the result that the action is performed automatically, e.g. in using a typewriter, reading fluently (as distinct from an initial spelling/reading), and adding or subtracting numbers proficiently (as distinct from a counting version of this operation (Van Oers 1990)). A theory of this kind of learning was developed in the Netherlands in the 1950s by Van Parreren (1954, 1978) on the basis of an action-psychological approach to learning. In the Vygotskian school of psychology it was mainly Gal'perin and his colleagues who elaborated an instructional theory about microgenetic learning processes (Haenen 1996). As this learning is basically an autonomous psychological process, aiming at specific goals (mastery, automatization), there is little room here for personal choice as to the course of this process. Hence, it makes no sense to call this kind of learning authentic.

2. *Learning as an expansion of an activity*, based on the acquisition of new actions in a context of a sociocultural activity, e.g. learning a new opening (pattern of actions) in chess playing, learning new mathematical actions (e.g. multiplying) in addition to already acquired actions (e.g.

addition), and elaborating a new concept. In these cases a person is already capable of participating in a cultural activity in a limited way, but she or he improves her or his capacity for participation by *adding* new actions to the already available repertoire of actions. Although this kind of learning can be imposed on a pupil by directly instructing her or him in the required action, it is doubtful whether authentic learning occurs in that case. But this kind of learning can also be based on problem solving that requires pupils' participation in the activity at hand. Evidently, it is possible for this kind of learning to be connected both to the activity (its rules, objects, motive, goals and instruments), and to the abilities and interests of the participants. It then both relates to personal interests of the learner and also incorporates – in an honest form – the sociocultural activity that constitutes the context of learning. However, for this learning to be called truly authentic, it must also encourage a participant to become an autonomous and critical agent, not just a competent robot. An important prerequisite for this agency is that children understand and master their own learning.

The structure of authentic learning activity

Traditionally, pupils spend a lot of school time in microgenetic learning processes (acquiring automatized operations), although the introduction and elaboration of cultural activities also receives attention in schools (e.g. comprehensive reading, mathematizing, reading maps, participating in religious ceremonies, physical exercise, etc.). Such a focus is a remnant of older notions of what constitutes adequate school learning. Davydov (1983) has pointed out that school learning is itself culturally and historically produced. He contended that learning by repeated experience and practice should be replaced by explicit knowledge-production based on using and applying abstract 'scientific' models. This kind of learning should result in scientific concepts that represent cultural achievements in disciplinary knowledge at the highest available level. Davydov refuted the idea of school learning as a process of imparting knowledge to pupils by drill-and-practice or by learning by experience. From a Davydovian point of view, this empirical or drill-and-practice style of knowledge-production is a bogus culture, as compared to Western culture's most developed mode of learning (i.e. science).

Davydov's view of school learning hinges on a notion that learning is not the acquisition of pre-existing knowledge and abilities, but is rather a form of knowledge-construction. Using culturally available models, pupils construct their own view of the world, bringing sense and meaning together. For Davydov, modern 'science' (which for him includes all disciplined inquiry) represents the culturally most developed means of knowledge-construction. Therefore, learning in schools must offer pupils an opportunity to participate 'in some honest form' in 'scientific' knowledge-production. This view is not utopian. During past decades, schools and educational psychologists have realized that acquisition of knowledge is not necessarily a result of direct instruction and microgenetic learning. Schools began to acknowledge that learning as knowledge-construction is

essentially a sociocultural activity that can (and should) be re-enacted ('imitated' in a Vygotskian sense) in the learning communities of the classroom.

However, Davydov's views need some careful scrutiny before his academic learning can be equated with authentic learning. In the first place, we question whether academic knowledge-production is the *only* cultural activity on which to model learning in school (Wardekker in press). The historical background is more complicated than Davydov suggests. Learning, in a sense of not only participating in an existing cultural activity but also producing culturally new knowledge that changes activities, probably occurs in all cultural practices, because every practice needs to change in order to maintain a relationship to other practices. Thus, every practice is a practice of actors-and-learners. If these practices are adequately re-presented in school, pupils should be able to form an 'imitating' community of actors-and-learners and thus learn to participate. Science can be seen as a historically developed practice in which learning (knowledge-construction) has been detached from everyday activities, thus making 'learning' into the goal of a separate activity. This, however, also means that knowledge constructed in the course of that activity is separated from other cultural practices, is detached and disengaged in that sense, and has to be re-contextualized in order to be able to function within these cultural practices. When educators regard school exclusively as a community imitating scientific learners, they accept the Western idea of disengaged knowledge as a leading ideal and have to think about how pupils will be able to contextualize that knowledge (Van Oers in press b). This argument may have far-reaching consequences both for school learning and for the curriculum in schools.

Our second question, directed to Davydov's conception of learning as an imitation of scientific knowledge-construction, concerns the essential characteristics of that mode of knowledge-production to be preserved in schools. Davydov's answer is not satisfying. Although his emphasis on the importance of abstract theoretical models as symbolic representations of scientific achievements is important, we doubt whether presentation of these abstract and basic scientific models as a starting point for pupils' learning is an honest representation of the actual scientific enterprise. Obviously, it is impossible to give a final definition of science because this activity is re-defined by every generation. Consequently, it is impossible to describe exactly how scientific learning (knowledge-producing) activity should occur. Nevertheless, some general guidelines can be identified (Van Oers 1996b). The scientific process is understood here as the management of meanings and collaborative meaning-construction. Problem solving, argumentation, use of symbolic tools (signs), and reflective comparison of available (including conventional) solutions seem to be essential ingredients for re-inventing valuable truths. Heterogeneity and polysemy are more characteristic of this kind of knowledge-production than uniformity and unequivocality. Knowledge-construction is a process of experimentation and negotiation in a community of learners.

If school learning ought to reflect these characteristics of scientific activity, it should be carried out as an argumentative problem-solving

activity with the help of symbolic tools (Cobb *et al.* 1993, Forman and Larreamendy-Joerns 1996, Van Oers 1996a, Wardekker in press). Hence, abstract models are not to be introduced as fixed and exclusively valued starting points of school learning, nor as fixed goals of learning, but only as one possible solution (from a teacher's perspective), the meaning of which can be discovered by pupils negotiating a variety of solutions. Recent postmodern discussions have refuted the idea of authority and fixed truth that can be conveyed from teacher to pupils (Aronowitz and Giroux 1991, Latour 1991, Usher and Edwards 1994). If scientific models are to be understood, pupils will need to gain access to them by experimenting, reflecting and negotiating meanings with the help of symbolic tools (language, diagrams, schemata, drawings, formulas, etc.). This making sense of a variety of meanings is here considered to be the core of scientific learning.

Learning and semiotic activity

In this view of learning as knowledge-construction by experimentation and negotiation in a community of learners (Carpay and Van Oers in press), reflection on the meaning of signs is taken to be essential. This reflection on the interrelationship between sign and meaning is called *semiotic activity*. All concept formation somehow depends on systematic expression of thoughts with the help of symbols, requiring sometimes the invention of new symbolic representations, and reflection on symbols and their meanings (Van Oers in press c). This is true for learning in science as well as in schools.

Semiotic activity consists in every inter- or intra-personal reflection on the interrelationships between a sign and its meaning(s) in order to investigate and improve mutual correspondence. Signs can be words or graphics (e.g. symbols, drawings, diagrams or schemata). To make a sign and its meaning match optimally, the sign, the meaning, or both can be adjusted: sometimes people modify the sign to make it more adequate for the expression of the meaning, sometimes they elaborate the meaning in order to adjust it to the sign. The following example, taken from our observations of meaning-making in primary schools, illustrates these different tacks in executing a semiotic activity:

Two 5-year-old boys who have co-operatively put together some kind of building wanted to express precisely the meaning of their object:

- Boy 1: 'Look at the house, this is a house.'
 Boy 2: 'No it's got only one room; it is a garage.'
 Boy 1: '... a house can have just one room, isn't it?'
 Boy 2: 'No a garage is for cars, and then one room is enough.'
 Boy 1: 'But I don't want just a garage; it needs a house as well.'
 Boy 2: 'Okay, let's build a house, but it must have a room and another room and a bedroom ... a roof.'

In this conversation the boys reflect on the meaning of their building and how this meaning could be expressed with a word (a verbal sign). In this reflection they offer an example of a shared semiotic activity. Boy 1 obviously sticks to his word-sign and proposes to change the object (make a new building) to make it correspond more closely to the word-sign ('house'); Boy 2, on the other hand, wants to preserve the building as it is, but just change the meaning of the building by giving it another name ('garage'). To solve the problem, he concedes the building of the house so that he can preserve his view of the relationship between the original object and the word-sign ('garage').

In semiotic activity people are always investigating the relationship between sign and meaning, and modifying sign or/and meaning to make them correspond more closely. If learning activity is ever to be authentic, pupils should be involved as legitimate participants in this sociocultural knowledge-production and be capable of carrying out this semiotic activity in some honest and personally significant form. Consequently, authentic learning should never be defined merely in terms of personal interests or private ownership, nor in terms of the scientific status of its contents. Indeed, to be authentic, learning must be a specimen of knowledge-production in some domain of knowing. This always includes other people, cultural rules, conventional models, etc. For instance, authentic mathematics learning is not just a personal discovery of some mathematical rule or concept: mathematical learning at school can only be called authentic if the organization of this learning activity conforms in some honest form to the dynamics of the activities of the mathematical community. Problem solving, schematizing different solutions, expressing solutions with the help of symbols, and comparatively negotiating available solutions are basic elements of this *mathematizing* (Freudenthal 1991, Cobb *et al.* 1993). Learning mathematics by mathematizing is what we call here authentic mathematics learning. It includes (Lampert 1992) both learning mathematics authentically (according to personal interests and questions) and also learning authentic mathematics (i.e. mathematics in an honest form). Ideally, the result should not be that pupils know and are able to use a number of mathematical 'truths', but rather that they can participate in a competent way in constructing mathematics as a cultural activity.

Although we emphasize that there is no eternal definition of mathematics, there are some general characteristics that seem to regulate mathematics as people know it (Van Oers 1996b). Only in this sense do we believe that realistic mathematics education (as established, for instance, by Freudenthal in the Netherlands) is also promoting authentic mathematics learning. Learning mathematics by mathematizing can reasonably be called realistic, because it promotes the production of mathematical knowledge in some honest form (i.e. it conforms to the mathematician's style of thinking) and in accordance with a pupil's own questions, interests and private solutions.

Our studies are based on an assumption that semiotic activity is a very important element of constructive learning. By becoming meaningfully involved in different forms of semiotic activity, children may acquire insight into this sociocultural meaning-making and may come to under-

stand their own learning better. The importance of a child's understanding of his or her own learning is acknowledged by several experts. Pramling (1996: 565) maintains that

if our knowledge about children's learning should make children better 'learners', we must develop their understanding of their own learning. Finally, since learning always has an act and a content aspect, developing children's learning means developing both of these aspects.

This conclusion underscores the third aspect in the definition of authentic learning. It is not just learning some cultural activity in some honest form and according to a person's own interest, it is also learning in which a learning person is the real agent; learning that she or he understands (as far as possible) and takes responsibility for. *Authentic learning is not something that happens to a individuals, but something that individuals do for themselves.* This contention may be compared to Socrates' emphasis on self-knowledge.

Investigating semiotic activity of young children

The question now arises: how does this mode of learning evolve? Can schools promote authentic learning and assist pupils to become 'authentic learners'? Our interest in the development of authentic learning was inspired by Vygotsky's thesis that a study of a psychological phenomenon should always include the development of that phenomenon. Hence, our interest is in the developmental roots of this learning activity. We will describe our observations of precursors of semiotic activity in play activities of 4- to 7-year-old children in Dutch primary schools (Oers 1994, in press a). The choice of play activity as a context of learning and semiotic activity is based on the child-development theory of Vygotsky and El'konin (1972). According to this theory, learning and other cognitive activities of a young child should be embedded in play in order to make those activities relevant and maximally productive for her or his development.

Hence, in our studies we asked the following questions:

- Can young children perform semiotic activity in some honest form in the context of their play activity?
- Is this activity – when it occurs – personally interesting for the children?
- What are the implications of our findings for the curriculum?

Although in our examples the development of agency as suggested by Pramling (1996) will be visible, this was not an issue in the investigations described here.

Methodology

The context of our investigations can be characterized as a developmental research programme in which theory development and development of

teaching practices go hand-in-hand. In collaboration with Algemeen Pedagogisch Studiecentrum (APS; Non-Denominational Pedagogical Centre), a Dutch institute for educational innovation, we selected schools that had developed considerable expertise in working along the lines of a Vygotskian concept of education, using a play-based curriculum strategy called 'basic curriculum' developed by an APS working group headed by F. Janssen-Vos, in use in about 10% of Dutch primary schools. One tenet of this approach is that the learning of young children (4- to 7/8-year-olds) must be embedded in children's play (El'konin 1972, Van Oers in press a). APS innovators assisted teachers of those schools (for one year or more) in their attempts to implement the Vygotskian concept of developmental education. These in-service teacher trainers visited the school regularly, observed lessons, helped teachers to improve their classroom teaching strategies, and discussed lessons and strategies based on teachers' written self-reports and logbooks. The innovation strategy was based on the notion of teaching as a joint activity of teachers with innovators, scientists and teacher trainers (Van Oers *et al.* 1996). By going back and forth between theory and practice, a curriculum strategy was gradually developed, and teachers acquired expertise in working with this concept of teaching. This cyclic process of theory and practice development is now called 'developmental research' (Gravemeijer 1994: 112–114). One important characteristic of this research is that new theoretical ideas are regularly introduced in conversations with teachers, who try to make sense of them by negotiating meaning, and by trying them out in everyday practices. With the help of the innovators a teacher tries to implement these ideas in her or his practice, while the researcher observes resulting practices, evaluates the outcomes, tries to improve and clarify ideas, or perhaps decides to discontinue a practice if it is not succeeding. A characteristic of this method is that the researcher is involved in curriculum reconstruction (Smagorinsky 1995).

Thus the notion of semiotic activity in young children's play was introduced into younger children's curriculum. As a starting point we recommended that the teachers encourage children to make drawings or schematic representations of parts of their play activity or play objects. Research studies of Venger (1986) and his team in the 1980s in Moscow had demonstrated that young children could be engaged in this kind of representational activity, and showed that they could make schematic representations of different parts of their school curriculum (stories, songs, objects, etc).²

We decided to introduce that idea in the curriculum of the classrooms in which we collected our data. We arranged for video-recordings to be made of various classroom activities occurring in the normal course of a school day. We analysed different video-recordings of young children (5- to 7-year-olds) engaged in play activities in small groups. We studied and made in-depth analyses of these different play sessions, at different moments, in different schools – a variety intended to exclude a possibility that results (as to semiotic activity and personal engagement) were just an accidental consequence of one specific situation. By following this *multiple-case, replication design* (Yin 1994: 44–53), we tried to corroborate the

phenomenon of meaningful semiotic activity in children's play and identify conditions in which it occurs.

The nature of the activity-settings and the teacher interactions required symbolic representation. In analyzing video-recordings we looked for examples of children engaged in reflections on sign-meanings relationships, as well as for indicators that could be related to their willingness to be involved in this semiotic activity for some time.

At present, we are still clarifying the notion of semiotic activity, as well as identifying conditions of its occurrence, with the help of classroom observations. Hence, to this point, we have only undertaken qualitative analyses of different cases of children dealing with symbols in the context of their play. We reasoned that this was appropriate in the present stage of the developmental research programme.

Defining core notions

In our observations of young children's play we adopted the definition of semiotic activity as outlined above as a starting point. If semiotic activity did occur – in some honest form – in the context of play, it must be possible to observe it. However, on the basis of the fundamental tenets of our curriculum approach, it would have been unacceptable to force pupils into this activity. We assumed that, if semiotic activity were really accessible for these children, it should be possible to provoke interest in this activity in children by encouraging them, somehow, to make drawings related to their play. However, one of our concerns was still how we could introduce these cognitive activities in children's play without disturbing or spoiling it. In all sessions we taped and analyzed, children were playing in small groups with toys that required use of their imaginations (e.g. making a railway track), were role-playing in some area of the classroom (playing shoe-shop), or were engaged in a playful constructive activity (e.g. building a castle). We wondered how we could establish the children's interest in semiotic activity, so that we could discontinue the activity if necessary, before the children themselves quit.

As the children were always free to participate or not, we reasoned that the *decision to participate* in this semiotic sub-activity of a play could be taken as one sign of interest on the children's part. Moreover we reasoned that *persistence* for more than five minutes would be another sign of interest. However, this time-span is arbitrary, and some semiotic activities can be meaningfully completed in fewer than five minutes (e.g. when children discuss the meaning of some object on a drawing, or the meaning of a word). So in itself this criterion of persistence (in terms of duration in minutes) can be a partial but not a conclusive sign. As another sign of interest on the children's part we took the *flow of new ideas* (new questions, problems, solutions or expansions of the activity). We interpreted such a flow of ideas as another sign of the children's involvement and interest. Finally, a *wish to restart* the activity (or a part of it) at a later moment was also taken as a sign of the children's initial interest in the semiotic activity.

In our observations we always took into account these criteria in order to estimate the relevance of the activity for the children themselves.

As relevant cases for our observations, we required settings in which children were playing freely, and for which they had volunteered. In all cases the children were playing in small groups (varying from two to six members). The teacher participated in children's play to assist them in those actions that they could not perform independently, but which they wanted to carry out. As a participant the teacher sometimes acted at a base-level of play (e.g. playing a customer in the shop), and sometimes she or he acted at a meta-level (i.e. asking questions, explaining things, suggesting solutions, or pointing out problems). Note that these actions by the teacher are similar to those of the children.

Our main observations were made in the following situations:

- children (4- to 6-year-olds) playing with a self-constructed railway track (Van Oers 1994);
- children (5- to 7-year-olds) role-playing in a shoe-shop that they established together in the school (Van Oers 1996c); and
- children (4- to 6-year-olds) playing castle-builders, constructing a castle in a project about castles (Van Oers 1997).

Results

In both the railway-track and the shoe-shop play we encountered moments in which the teacher tried to provoke semiotic activities that did not succeed. When the teacher first invited the children to make drawings of their tracks (arguing that school janitors would put away their real tracks in the evening) the children said that they would remember the next day how their track was, so that they could rebuild it. This invitation to drawing was obviously not interesting enough for them. When we retried this activity with other groups of children, saying that they had been asked to send drawings of their tracks to another school so that those children could rebuild their tracks, then the children started to draw their tracks very carefully. While drawing, they received some help from the teacher, who directed their attention to different parts of the tracks. By doing so, she encouraged the children to reflect on the relationship between the drawing and the track.

In the shoe-shop play, the teacher once tried to provoke a reflection on the word 'pair'. She showed one shoe and asked for the other one that matched it. In this conversation the teacher tried to stimulate children to reflect on the meaning of the word 'pair'. This attempt, however, failed: the children kept saying 'the same shoes', 'two of those', 'similar shoes', or words to that effect. Their vocabulary at that moment was obviously rich enough to express the notion 'pair' in another way. There was no inherent need to develop another notion, nor to carry out the semiotic activity required for such an alternative.

These and other observations made it clear that semiotic activity could only be promoted in children's play when the activity made sense to the

children, when there was some inherent need for it, and when it was functional in the play. Moreover, another important condition for the emergence of semiotic activity was the presence of a teacher who could assist children when they ran into problems with their activities or when they needed new hints for solving their semiotic problems.

On every occasion on which we were able to create meaningful problems in their play that could be solved with the help of semiotic activity, the children could be involved in reflection on signs (drawing, diagrams, symbols) that lasted for more than 5 minutes. Moreover, children seldom dropped out; they kept producing new problems or applications of their invented signs. Sometimes the children started using the learned symbols in new situations, and in almost every case we saw that children were willing to restart the activity after a break, even after several days (Van Oers *et al.* 1996). We cannot but conclude that semiotic activity can be made interesting for children as a part of their play, when this activity is functional and when they can get assistance from an 'expert semiotician' (teacher or peer), when required (Van Oers, *in press a*).

What did we learn about semiotic activity itself in these situations?³ While playing in the shoe-shop, the children ($n = 5$) encountered a problem of how to indicate on the outside of a shoe-box what kind of shoe was inside. In talking about this problem, they invented the solution of making labels: writing signs on labels and sticking them on the boxes. But when they started making labels they discovered that the labels should discriminate among different kinds of shoes, so they had to invent different signs for the labels. At a certain moment, one child suggested that they could write the letter *M* for 'mama-shoes'. Gradually they invented labels with *M*, *P* (for 'papa-shoes'), and *K* (for 'children-shoes'; Dutch *kinderen* means children). With the help of these labels they started categorizing the shoes, making different piles of shoes, and drawing different piles of shoes (actually making schematic representations that we would now call 'histograms'). Later on – after a break – they resumed the semiotic activity, doing mathematical actions with the help of the 'histograms' (counting boxes, and checking them against the real piles). In that activity the children decided for themselves to use again those letters that they used before, and they wrote *K* on the column of children-shoes.

During this activity the children frequently looked inside a box to see if their sign really matched the shoe inside. If it did not, they sometimes changed the sign, or put another shoe in the box. In a more abstract language we can say that the children were reflecting on sign-meaning relationships. If the sign and the meaning did not match, they changed one of them in order to make them correspond. In the context of their play the children performed a genuine semiotic activity.

We also examined whether semiotic activity could be used to stimulate forms of mathematical thinking: to find out how far the children's zones of proximal development could be stretched towards mathematically relevant semiotic activity. We wanted to find out if children, engaged in a semiotic activity, would use this activity also for the invention of notational systems for quantities and relations.

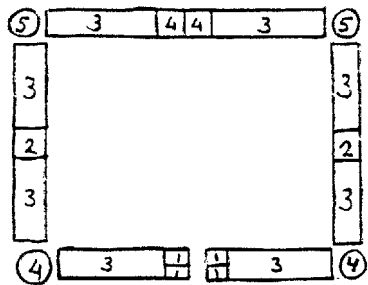


Figure 1. The teacher’s castle.

In one school working with the play-based curriculum, we observed how a teacher introduced in her class a new series of activities starting from one central theme (castles). The teacher introduced that theme by stories, by a visit to a local castle, and by theme-related books and pictures children brought from their homes. In the classroom ($n = 31$) different activities were established related to castles. In the context of this theme the children performed a great variety of activities related to castles, such as reading about castles, playing out stories in castles, and constructing miniature castles from all kinds of materials. When the children were deeply engaged in a variety of theme-related activities, the teacher sometimes gave the children suggestions for extending their activities into new forms. Different expansions of the activities were made, including making drawings of castles that the children had built, or building castles from a construction plan.

One morning the teacher had provided a construction plan for a castle (see figure 1), and discussed with the children how they could read this kind of plan.

After that introduction Stephan and another boy were invited to build this castle with blocks in a corner of the classroom. The boys started building this castle on top of the plan. They were constantly looking at the plan, carefully checking whether their building did correspond to the plan’s requirements. To do so, they had to push aside parts of their building to consult the plan’s prescriptions. After about 20 minutes they finished their castle and started playing with it. They inserted small puppets and animals and were busy making it look like a real castle in which people were living. Then we suggested to Stephan that he could make a drawing of the castle in its current state.

Stephan picked up the idea, but he could not just copy the plan given by the teacher, as it was hidden under the castle. So he started drawing the castle (see figure 2) directly from their building, including the towers, walls, battlements (see top of drawing), gate and barred windows (in the centre). During his drawing the boy checked the castle several times.

To begin with, we noted that Stephan did not copy the teacher’s plan in any strict way. He even rotated his plan 90° as compared to the teacher’s. In the lower right corner of this drawing he wrote a numeral (4) indicating how many blocks should be put on top of each other (see figure 3).



Figure 2. Stephan's castle.



Figure 3. Stephan's '4'.

However, he did not seem to be satisfied with how he wrote the numeral, and explained to the observer: 'This is a four'. When he continued, he shifted to an analogical way of symbolizing quantities by drawing small circles in the blocks. Notice that this was also his own invention it was not indicated in the teacher's plan. In the block at the left he drew four circles at first, but after checking he erased one by crossing it out (see figure 2). Here we see that the boy worked reflectively, regularly checking his drawing with the building. Obviously, he was carrying out some sort of semiotic activity, reflecting on the relationship between a sign (his drawing) and its intended meaning (the castle). Sometimes he modified his drawing (sign) and make it match better to his castle. In this manner he completed the drawing of his castle.

When he said he was finished, the observer asked him why he drew just one side, and wondered if he could do it with the other sides as well. Stephan then took another piece of paper and started drawing another castle wall, that he called 'the back-side' (figure 4). After he finished this drawing, another boy offered a negative comment: according to the other boy, Stephan's second drawing did not correspond to the initial construction plan outlined by the teacher. Stephan then took some glue, and stuck the two drawings back-to-back (after checking they had the same upright

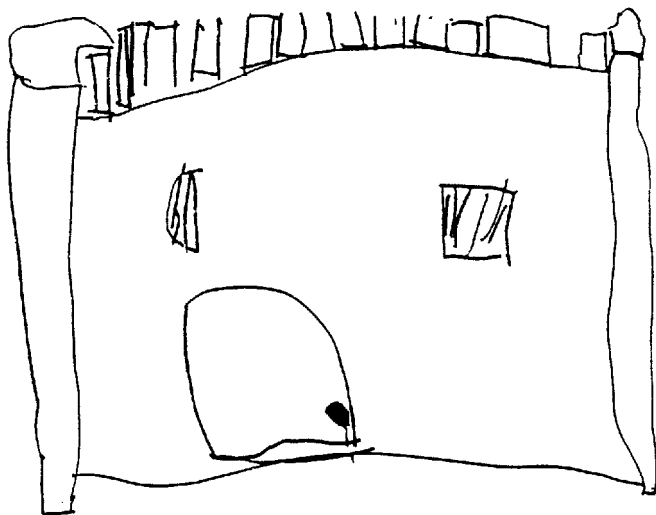


Figure 4. Stephan's castle back.

direction). Asked by the observer whether there should not be numerals on the reverse side, he answered decisively: 'No, the numerals are already on the front'.

Obviously the two drawings were related by a one-to-one correspondence, and the boy used this relationship in his reflections on the drawing and its correspondence with the real castle. Although this activity of representation may look very abstract, for the boy it was really an expansion of his initial construction of the castle. He remained very involved with his drawing activity embedded in the castle-building activity. In this expansion we saw new elements emerging that were not generated by the object of the building activity itself:

- inventions of new and functional ways of representing quantities,
- use of symbolic representations,
- reflection on sign-meaning relationships, and
- use of abstract relations (one-to-one correspondence).

We offer one more example from this classroom, based on observations of other children involved in an activity of representing their constructions, and at the same time performing a semiotic activity. Two boys (Jeroen and Steijn) had jointly constructed a castle according to the teacher's requirements (e.g. they had to use a U-shaped tube). After finishing their building, the teacher asked whether they wanted to make a drawing of the front side of their castle. The boys eagerly accepted this invitation and were intensively involved (for 11 minutes) in this representational activity. In a video-analysis, it is clearly observable how they check the correspondence between their drawing and the castle several times. The dots in Steijn's drawing (see figure 5) testify to his counting.

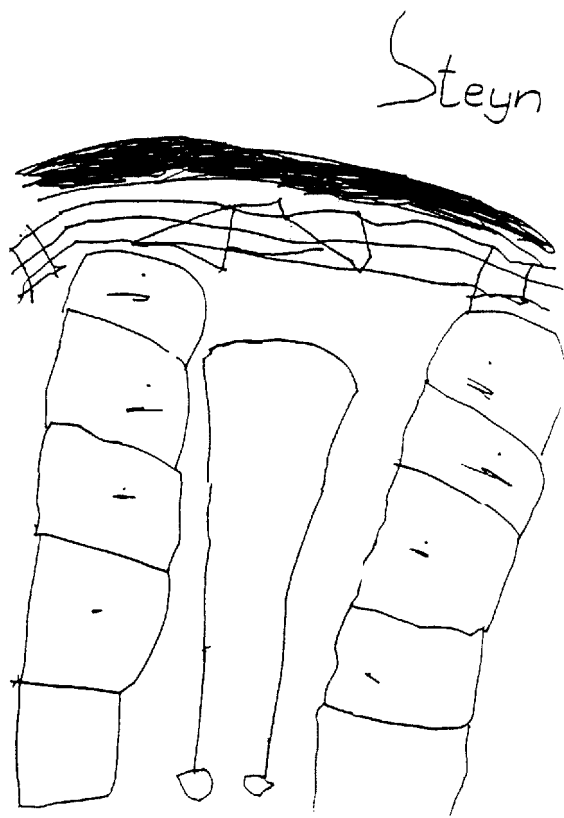


Figure 5. Steijn's castle front.

Jeroen tried to represent his castle very accurately, constantly looking back and forth between his drawing and his castle. Figure 6 reveals how Jeroen finished his castle.

Then the teacher came to look at his castle, and – as is usual in this classroom – evaluated the product in discussions with the pupil. In this conversation the teacher noticed that castle walls were not the same as those on the drawing ('not as many blocks'). Jeroen checked again and admitted that the drawing and the castle did not completely correspond. The teacher asked whether he wanted to change it and the boy said that he did. After some reflection he drew two extra horizontal lines in his walls (one at each side of the gate, see figure 7). Of course he could have changed the castle as well, but this seemed far easier. Again we see an example of semiotic activity, performed as reflection on sign-meaning relationships, resulting in modifications in the sign.

Conclusions and discussion

Our classroom observations of 4- to 7-year-old children involved in play have shown that their activities can evolve into genuine semiotic activities,

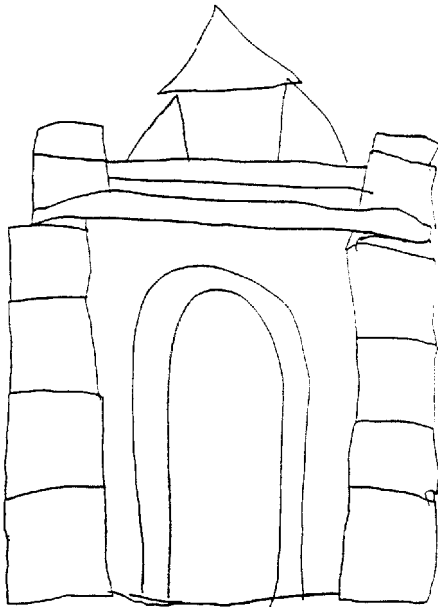


Figure 6. Jeroen’s castle, first version.

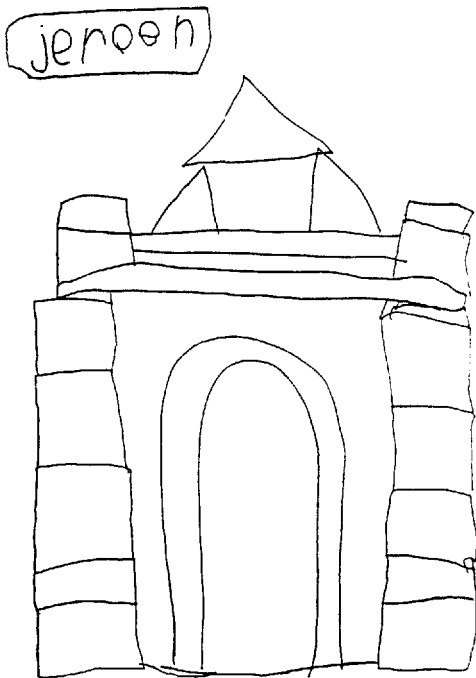


Figure 7. Jeroen’s castle, second version.

sometimes resulting in an articulation of the meanings involved, sometimes resulting in a modification of the sign (diagram, drawing). It is clear that this semiotic activity is accessible for these young children, provided they can be embedded in their regular play in a functional and meaningful way.

On the basis of our present evidence we have reason to conclude that young children can be meaningfully involved in semiotic activity that is actually a simplified but honest exemplar of later discipline-bound semiotic activity. It goes without saying that later semiotic activity in discipline-bound constructive learning is more strictly connected to conventional rules, and to the outcomes of scientific thought from cultural history. Even more important, this semiotic activity of young children can be made relevant when it is meaningfully embedded in their play. Hence, two basic elements of authentic learning are already present in the younger child's semiotic activity.

Although longitudinal research has still to be carried out to estimate the real impact of this early semiotic activity on the transition to later authentic learning, our observations give us every reason to believe that semiotic activity can be promoted in early education. On a theoretical basis we assume that this semiotic activity is one of the psychological roots of authentic learning. Hence, we assume that there is enough reason to continue this approach in early education.

In the studies reported here we used mainly situations in which the child had to represent symbolically a perceptually accessible situation. We will have to figure out whether and how this semiotic activity is or can be carried out by young children with regard to imaginary situations (e.g. stories, melody). With regard to curriculum, we also have to be cautious about jumping too easily to conclusions. In early grades curriculum we note that semiotic activity cannot be forced upon all pupils at the same time in an identical way. As semiotic activity is dependent on what a pupil recognizes as a real problem, we have to take into account the fact that the curriculum should be multi-dimensional as well, giving all pupils a variety of opportunities for semiotic activities, but probably not all at the same time, nor on the basis of the same problems. Hence, a curriculum that tries to promote semiotic activity and tries to develop it towards disciplined learning cannot be planned in advance on a uniform day-by-day basis. Such a curriculum requires sensitivity in a teacher, and an ability to become involved in a genuine, authentic conversation with his or her pupils. Authentic learning means that a pupil is accorded some responsibility for the course of learning in a real cultural practice. By practising in a community of learners from an early age, being given real responsibility, being taken seriously, and getting involved in meaning making with the help of symbols, children become authentic learners.

This focus on meaning-making capacities of children also turns out to be productive in terms of emergent numeracy (Van Oers 1996c) and emergent literacy. We reasoned that the understanding of reading by young children would be more successful (and authentic) when the children get a grip on the real meaning-making going on in a text. That is why the schools working with the previously mentioned 'basic curriculum' start the process of learning to read independently by bringing children into a

position of being a writer (text-composer), requiring production and investigation of the meaning of symbols, and expressions in writing.⁴ As far as can be seen now on the basis of classroom observation, this approach to learning results in authentic readers as well.

Our results and speculations with regard to curriculum point in the same direction as that put forward by Pinar *et al.* (1995) who recommend a reconceptualization of the curriculum as constructed in the classroom. We should redirect our efforts from curriculum development outside the schools towards the understanding of the curriculum being constructed in the classroom.

Notes

1. A earlier version of this paper was read at the 1997 annual meeting of the American Educational Research Association, Chicago, IL.
2. Incidentally, this approach is still being implemented in an experimental early education programme in Moscow (Djačenko 1994).
3. For a more detailed description, see Van Oers (1996 d).
4. A detailed educational strategy has been elaborated recently (Knijpstra *et al.* 1997).

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